

Burr knots in apple trees: Causes, environmental factors, and management

Burr knots, or burls, are adventitious root formations found on certain apple tree varieties, notably those with specific rootstocks and cultivars like Gala and Empire. While advantageous for propagation due to their rapid root growth, burr knots present challenges in orchard management. This article explores their genetic and environmental triggers, dating back to the 19th century when varieties like Burr knot were favoured for their ability to propagate easily from cuttings. Despite their historical significance, burr knots require careful management to minimize their impact on apple orchard health and productivity. Understanding their causes and implementing proactive management strategies are essential for maintaining healthy apple tree population.

BURR knots, also known as burrs or burls, are formations of adventitious roots that emerge on the above-ground portions of certain apple trees. They can be induced by environmental factors, but specific rootstocks such as the dwarfing varieties M9 and M26, M.7, MM 106, or MM.111, Mb Srinagar, M oxiantail and *Malus maschuri* as well as certain cultivars like Gala, Empire are genetically inclined to produce them. These rootstocks were carefully chosen in the early stages of rootstock breeding programs because they have a strong ability to grow roots quickly, making them simpler to propagate from cuttings or by layering. However, this tendency to produce roots easily can also result in the development of adventitious roots and burr knots. A type of apple, called Burr knot, was found in England around 1818, but its exact origin is unknown. It is known for having bumpy growth at the base of its branches that can grow into new trees if planted. Farmers, especially in South Wales during the 19th century, liked to grow Burr knot and similar varieties because they could easily grow new trees from cuttings. Additionally, Burr knot has been used as a rootstock in the past.

Causes of burr knot

Burr knots can have various causes, both biological and environmental. One primary cause is the presence of dormant buds on the rootstock. When the rootstock is damaged or stressed, these dormant buds can become activated, leading to the formation of burr knots. And also, improper pruning techniques, such as leaving stubs or making incorrect cuts, can contribute to the development of burr knots. Furthermore, certain apple varieties are more prone to burr knot formation than others, so the choice of rootstock and scion combination is crucial in mitigating this issue.

Environmental factors that favours the burr knot

Several environmental factors can influence the formation of burr knots. Excessive moisture in the soil, poor drainage, and waterlogging can create conditions conducive to burr knot development. Conversely, drought stress can also trigger the activation of dormant buds on the rootstock. Additionally, nutrient imbalances, particularly deficiencies in essential elements like calcium, potassium, and boron, can predispose apple trees to burr knot formation. It is essential to monitor environmental conditions and address any imbalances promptly to minimize the risk of burr knots. Factors that can cause burr knots to develop include shade, high humidity, and temperature between 20-35°C. Certain apple rootstocks and varieties are more prone to them due to their genetic makeup. Rootstocks that readily produce roots, which are preferred for propagation, can also be more susceptible to forming burr knots because of their tendency to generate adventitious roots.

Difference between burr knot and crown gall

Another type of outgrowth that occurs and looks similar to burr knot is due to a bacterial infection called crown gall. Unlike burr knots, crown gall typically forms near or below ground level, mainly on the roots or at the base of the trunk. In the early stages, crown galls resemble warts and may protrude further from the trunk than burr knots. Crown galls change in appearance as they develop. Initially, they look like warts, starting off soft and spongy with a light colour. Over time, they become rough and corky, with an irregular surface and a hard woody inside. As they mature further, they turn dark brown and woody. Some may eventually break down and disappear, while others can remain on the plant for its entire life.



Apple trees affected with burr knot, observed in ICAR-CITH, RS, Mukteshwar, Uttarakhand

Burr knot: Is it a problem?

It is a disorder, not a disease, but it may be a problem if the environment favours it. They can also become entry points for damaging pests like woolly apple aphids, dogwood, and plum borers, as well as infections by fire blight bacteria and wood-rotting fungi. Large burr knots or the merging of multiple knots can weaken the structure of a tree, making it prone to breaking during windy conditions or when carrying a heavy crop of apples. Additionally, when burr knots combine, they can stunt tree growth and hinder the transport of sugars from leaves to roots in the affected area. Moreover, the adventitious roots of burr knots are more vulnerable to damage from low winter temperatures compared to the surrounding plant tissue.

Management of burr knots

Effective management of burr knots requires a multifaceted approach that addresses both the underlying causes and the symptoms. Proper pruning techniques are paramount in preventing the formation of burr knots. Pruning should focus on removing dormant buds on the rootstock and promoting healthy shoot growth. Regular inspection of orchards is essential to detect burr knots early and take appropriate action. When burr knots are identified, they should be promptly removed to prevent further growth and spread. Additionally, implementing cultural practices that optimize soil drainage and nutrient

availability can help reduce the incidence of burr knots. There are no chemicals available for the prevention or management of burr knots. To deal with burr knots, the adventitious roots can be removed manually using tools like a knife, file, or rasp, especially if the affected area is small. However, even after removal, there is still a risk of diseases like fire blight or apple canker entering through the damaged area. If a large burr knot is blocking the growth of a branch, it might be necessary to trim off that section of the branch. This helps encourage new shoots to grow and replace the affected branch.

SUMMARY

Burr knots pose a significant challenge to apple orchard management, but with careful attention to causative factors and proactive management strategies, their impact can be minimized. By understanding the causes, environmental influences, and appropriate management techniques, we can ensure the health and productivity of our apple trees.

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